Presentation Overview

- Rural Preparedness Issues
- Walsh Center Research Activities
- WNYPHA APC Tool
- WNYPHA Planning Guide

Rural Lessons from the 2005 Hurricanes

- The 72-hour myth
- Evacuees can overwhelm rural systems
- Hospitals are not a panacea for rural preparedness – little excess capacity
- Preparedness is not solely an urban concern

Rural Preparedness Concerns

- Rural communities are home to many potential targets (nuclear facilities, agro-chemical plants, and refineries)
- Rural areas are the home to agricultural production, with an estimated 2,000,000 vulnerable sites in the U.S. alone
- Urban water supplies often originate in rural areas
- Infectious diseases can more easily be targeted at small communities with the same effect
- Issues of natural and technological disasters

Rural Preparedness Concerns (continued)

- Mass exodus from urban areas will undoubtedly affect rural communities
  - Barriers to Planning
    - Lack of surge population estimates
    - Low threat perception

Rural PH Response Issues

- Capacity*

- Lack of state and local PH response capacities in many rural areas
- Lack of uniformity in state and local PH systems for planning consistency
- Need to identify the expanded rural PH system for PH response

* As identified in "Preparing for Public Health Emergencies: Meeting the Challenges in Rural America"

Rural PH Response Issues

- Capacity* (continued)

- Identification of necessary competencies in rural PH response
- Need for model practices in rural PH response
- Limited human and financial resources to build necessary infrastructure
- Little impetus to address issues given low threat perception

* As identified in “Preparing for Public Health Emergencies: Meeting the Challenges in Rural America”

Who Will Respond?

- County EMAs
- Fire
- Law Enforcement
- EMTs
- Hospital Personnel
- HAZMAT
- Red Cross
- Salvation Army
- Local Govt. Agencies
- Veterinary Services
- Public Works
- Ag Extension

How do we assure that rural responders can fulfill public health response functions in lieu of or in support of limited rural public health capacities?

Spontaneous Evacuation

- Evacuation should not be conceptualized as the government bringing in buses and taking people to shelters
- Rather, the vast majority of people evacuate on their own, in their own vehicles

- *Where do they go?*
- *What are the implications for reception communities?*

What would you do?

- Imagine yourself transported nearly 30 years back in time, living in Harrisburg, PA.

Three Mile Island - March 28, 1979

- Only 3,500 should have left…144,000 people within a 15 mile radius of the plant evacuated (evacuation shadow)
- Median evacuation response: 85mi (137km), 100 mi (161km), 111 mi (180km) (depending on study cited)
- Virtually none went to Hershey shelter

- What might happen today?
  - Post 9/11 & Katrina
  - 24 hour news cycle

Walsh Center for Rural Health Analysis Evacuation Project

- Funded by HRSA, Office of Rural Health Policy
  - Key informant interviews
  - National survey of urban residents to assess evacuation intentions
  - Findings to inform development of the modeling and spatial analysis tool

walshcenter.norc.org

Key Informant Interviews: Methods

- 30-45 minutes by phone
- semi-structured interviews

3 Key Informant Groups:

- National Experts (6)
  - Academics
  - Government Experts
  - Private-Sector Researchers
- Urban/Rural Pairs
  - Local Rural Preparedness Experts (6)
  - Local Urban Preparedness Experts (5)
    - Emergency preparedness coordinators
    - Public health department directors

Key Informant Interview Findings - National Experts

- Evacuation “to” and “through”
- Risk communications is key
- Traffic control a major issue
- Mandatory evacuations generally less successful
- Perceptions of rural regions:
  - Rural regions unprepared
  - May not be receptive to evacuees
  - Need for development of regional coordinating bodies and response plans

Key Informant Interview Findings - National Experts

- Main challenges for rural regions:
  - Health-related concerns more challenging than providing shelter
  - Meeting demands of special needs populations
  - Meeting needs of evacuees exposed to radiation, chemical, or biological threat
- Recommendation: rural regions should set up reception sites for receiving evacuees, rather than letting them disperse through the countryside.

Key Informant Interview Findings - Rural Experts

Current Preparation

- Sheltering: all have identified shelters and estimates of the number they could absorb
- Health response preparation lacking
- Rural planners note that their hospitals generally operate at over 90% capacity
  - Would have to discharge patients to absorb evacuees
  - Temporary triage ctrs limited unless additional support
  - Specific numbers for hospital capacity range widely.

Key Informant Interview Findings Rural Experts—Needs and Concerns

Needed Information and Resources

- **Numbers/estimates of evacuees**
- **Demographics of evacuating urban center: who is coming?**

Concerns of rural planners

- **Sufficient resources/infrastructure**
  - **food, health support, law enforcement, water (particularly in drought-prone areas)**
  - **traffic and transportation issues**

Rural Experts' Bottom Line

While a larger overall number of evacuees may go to other urban areas in many scenarios, it will take fewer evacuees to overwhelm smaller, rural community systems. In addition to considering raw numbers of evacuees, *an analysis of the ratio of evacuees to existing population is an important planning consideration*.

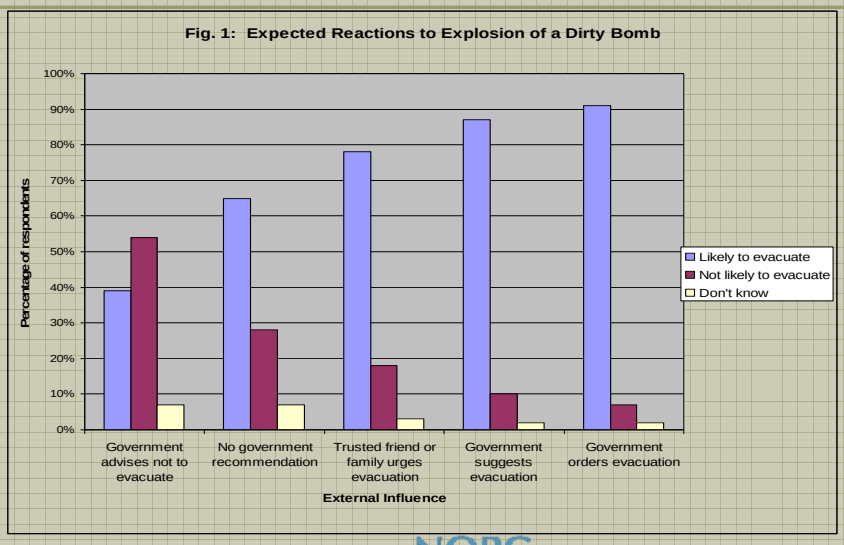
Key Informant Interview Findings - Urban Experts

- Few have considered urban evacuation to rural communities
- Destinations:
  - Most feel citizens will go to other urban areas, where they will "feel comfortable"
  - Family/friends, hotels & away from the threat/danger
- Shelter-in-place
  - Believe citizens will cooperate ***if*** message delivered appropriately
  - Consistent with national and rural experts, urban planners mixed in opinion of whether or not citizens will isolate/quarantine or evacuate if faced with pandemic flu

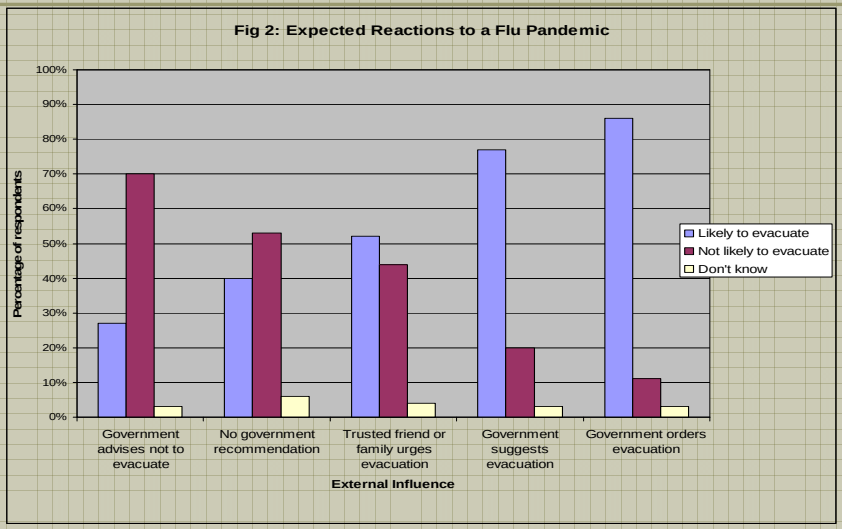
NORC Walsh Center Survey

- Prior surveys done before 9/11, Anthrax, and Katrina.
- Intent was to determine evacuation likelihood given a hypothesized change in national mindset

NORC Walsh Center Survey



NORC Walsh Center Survey



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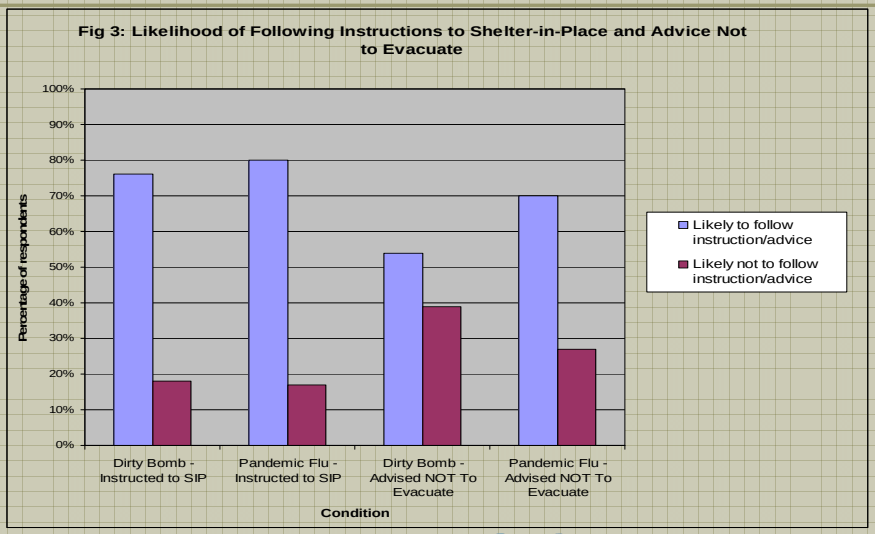

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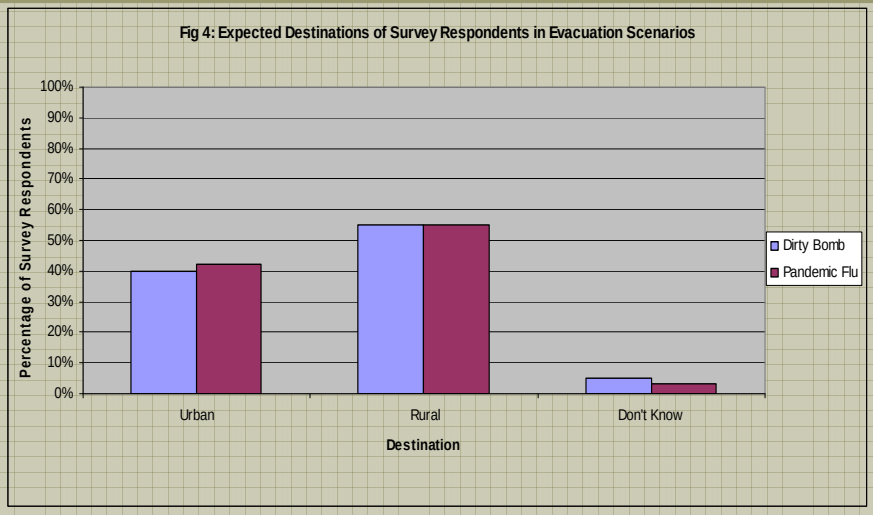

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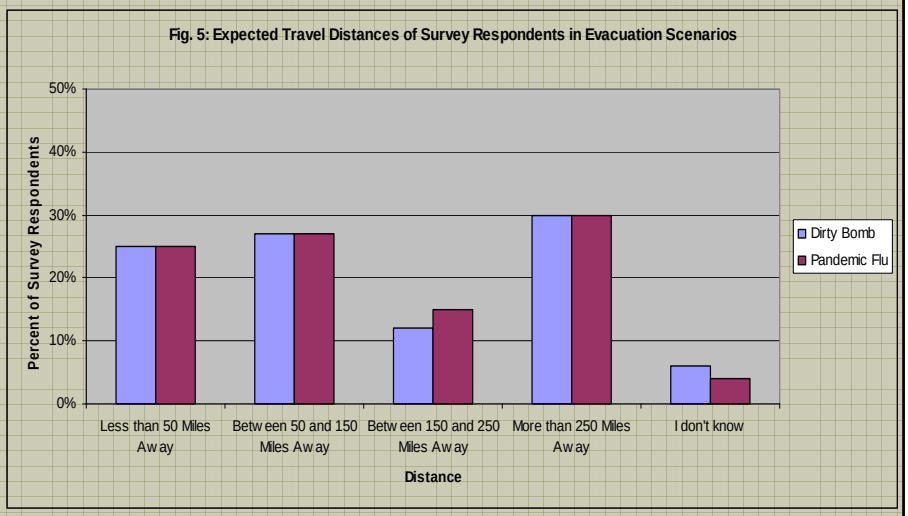


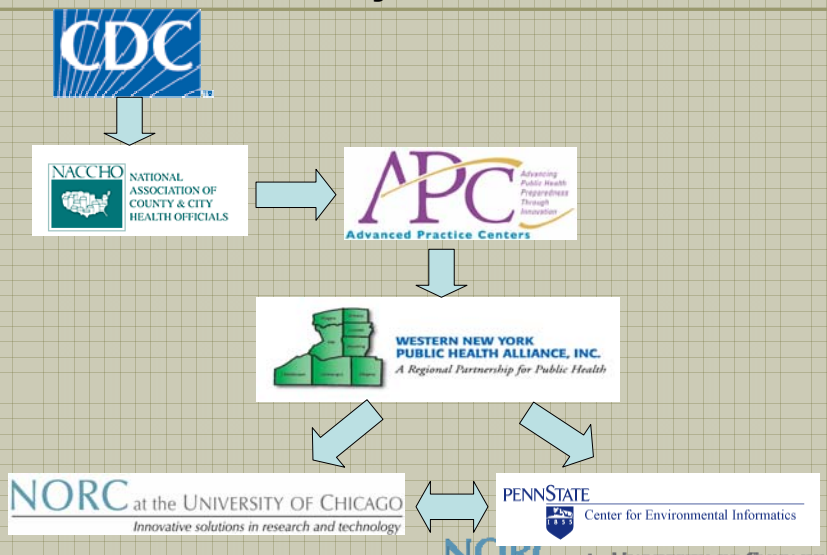
NORC Walsh Center Survey

Likelihood of Evacuation by Race/Ethnicity, Odds Ratios*

	Black	*p*	Hispanic	*p*
Dirty Bomb	1.84	0.01	1.96	< 0.01
Pandemic Influenza	3.18	< 0.01	2.49	< 0.01

* Note that white survey respondents (equivalent to 1) served as the reference group for this odds ratio analysis.

WNYPHA Urban to Rural Evacuation Project



APC Advancing Public Health Preparedness Through Innovation
Advanced Practice Centers

What is an APC?

Advanced Practice Centers are a diverse network of local health departments actively working to help all LHDs nationwide prepare for, respond to, and recover from public health emergencies. *Practical solutions developed by peers on the cutting edge of preparedness.*

A Sample of APC Topics:

- *Regionalization*
- *Race, ethnicity and language issues*
- *Dispensing of medications*
- *Isolation and quarantine issues*
- *Disease detection and investigations*

Urban to Rural Evacuation: An Environmental Scan

- To date, community risk assessments have tended to focus on issues within the specific community and have not examined the implications of population surge resulting from evacuating residents from neighboring urban areas. In many areas, public health infrastructure is likely to be stretched thin or possibly overwhelmed in such a scenario.
- At the same time, evacuation planning research has focused primarily on the successful exodus of urban citizens following a disaster situation, with little focus on likely destinations or secondary impacts.

WNYPHA APC Project: Purpose

The objective of this project is to develop a map-based tool to predict community population surge following potential urban disasters. We envision the final product being used as a planning tool for preparedness planners, and as an educational tool to inform policy makers about the issue of population surge resulting from urban evacuation.

The tool includes information on the number of likely evacuees, evacuee demographic information (such as presence of children, disability status, etc.), and local planning information.

"In preparing for battle, I have always found that **plans are useless**, but **planning is indispensable**." –General Dwight D. Eisenhower

WNYPHA APC Project: A Modeling Tool

"All models are wrong, some are useful"

- George Box, Industrial Statistician

"Prediction is very difficult, especially if it's about the future."

- Nils Bohr, Nobel Laureate in Physics

WNYPHA APC Project: Methods

- Identified variables predictive of urban evacuation patterns based upon historical evidence and key informant interviews with preparedness experts in metropolitan and non-metropolitan communities and national authorities
- Developed modeling algorithms using identified variables based upon availability of nationwide data sets containing county-level information
- Set variables based on NORC survey findings and historical evidence
- Worked with Penn State University's Center for Environmental Informatics to develop a web-based interface that provides access to evacuation information in a user-friendly manner.

How the tool works – 3 types of variables

Scenario Specific Variables:

- Based on the nature of the precipitating event – how much "push" does it have, and how many urban citizens are likely to evacuate as a result?
- Current scenarios: dirty bomb, pandemic flu, industrial/chemical

Demographics Variables:

- Based on the demographics of the urban area, who is more or less likely to evacuate? For example, people with children are more likely to evacuate; people with disabilities are less likely to evacuate, etc.

Pull Variables:

- Based on known information about counties surrounding the urban area, which will be more or less attractive to evacuees? Features that make a county more attractive include things such as road networks into the county, number of hotel rooms and second homes, family networks, etc.

Scenario Specific Variables

We have selected three possible event scenarios that may trigger self-evacuation:

- **Dirty bomb**
- **Pandemic flu**
- **Industrial/chemical incident**

(Many additional possibilities exist; this iteration of the tool will include these three. Future iterations of the tool may be expanded to include additional scenarios.)

Evacuation Scenarios – Dirty bomb

- Radiological dispersion device (RDD)
- Conventional explosive wrapped with radioactive material (**not** a nuclear bomb)
- Weapon of mass *disruption*—low radiation, high fear
- Public lacks knowledge of RDDs; may confuse with nuclear weapon
- Fear of radiation may cause more to evacuate, and to evacuate farther

Evacuation Scenarios – Pandemic flu

YEAR	RESULT
1918	500,000 US
1957-1958	70,000 US
1968-1969	34,000 US
2007??	*New: H5N1*

- Avian Influenza (H5N1)
- Influenza strains constantly evolving
- Avian flu highly virulent
- No immediate vaccine
- Healthcare quickly overwhelmed
- Shortage of essential personnel
- Some may choose to leave crowded city fearing exposure
- While self-evacuation did not occur in 1918, some postulate that this may have resulted from media downplay

Evacuation Scenarios – Industrial / Chemical incident

- Accidental or intentional (act of terror)
- Can involve factories, rail cars, tanker trucks
- Chemical or biological substance that poses a danger to human health
- Small evacuation may be ordered, but evacuation shadow is likely

Apex, NC – October 5-7, 2006: A fire at a hazardous waste facility led to the evacuation of 17,000 nearby residents

Demographic Variables

- Little historical evidence on which to base evacuation projections
  - Three Mile Island
  - Retroactive and prospective surveys
  - Most evacuation information based on natural disasters, such as a hurricanes, which may or may not translate to other types of disasters
- Walsh Center Survey findings used to fill in demographic variables when otherwise unavailable.

Demographic Variables

Examples of characteristics that have been demonstrated as predictors of evacuation in the literature:

Characteristic	Census Availability	Postive / Negative / NE
Risk perception	No	Positive
Presence of children	Yes	Positive
Number of children	Yes	No Effect
Household size	Yes	Negative
Social influence	No	Positive
Preparedness	No	Positive
Home ownership	Yes	Negative
Prior hurricane experience	No	Negative
Prior evacuation experience	No	Positive
Special medical needs	No	Positive
Disability in household	Yes	Negative
Distance from event	Yes	Negative
Retirement or fixed income	Yes	Positive (for females)

Pull Variables

A certain percentage of evacuees will go beyond the modeled region; the remaining evacuees distributed among potential destination counties, based upon their pulling forces:

- Distance
- Friends / family (natality, length of residences)
- Number of hotel rooms
- Number of second homes/vacation properties
- Number of hospital beds
- Population densities
- Road networks

Pulling forces also influence the distance evacuees will travel, based upon:

- Saturation of resources
- Resource availability beyond the core region

Modeling: Summary

- A certain percentage of the population evacuates, dependent upon scenario.
- The composition of this population is not representative of the population in general, but instead will reflect that some groups are more likely to evacuate while others are less likely to evacuate.
- The evacuees' destinations depend upon the attractiveness of the counties in evacuation scenarios.

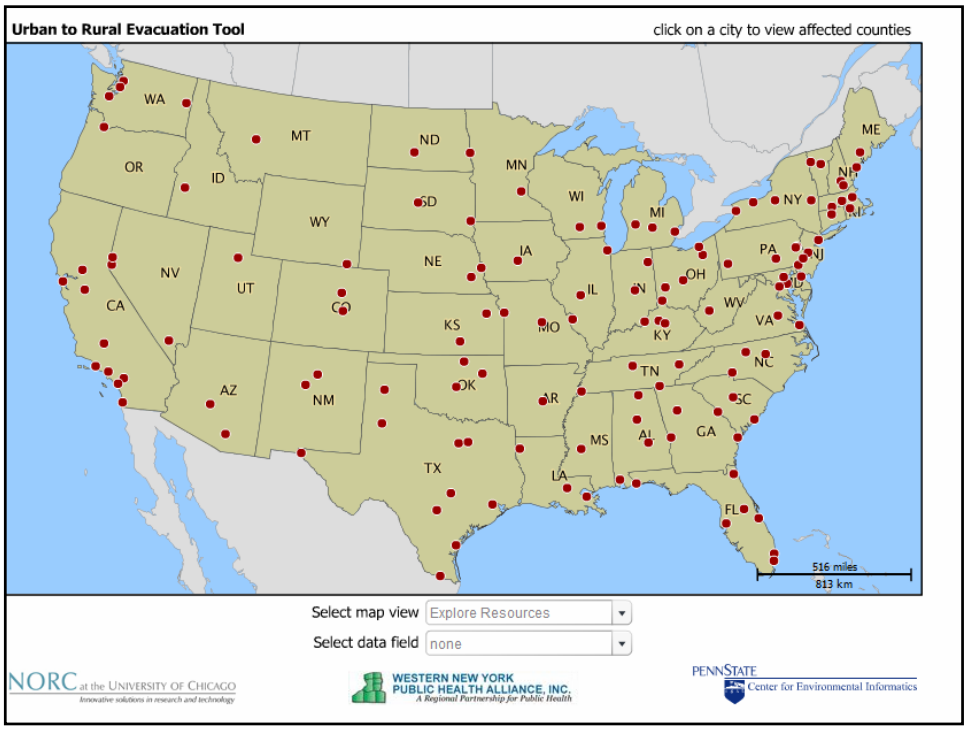
Setting Variables

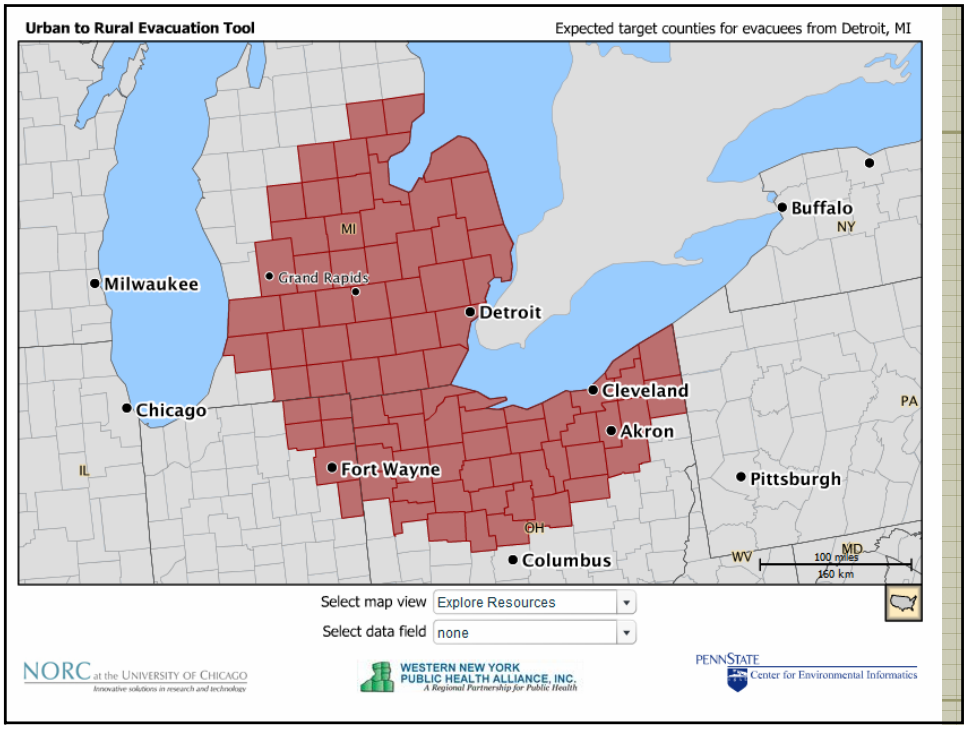
Setting variables:

- Historical studies (e.g., TMI, hurricanes)
- Survey research
- Expert opinion

Data sources:

- U.S. Census Bureau
- U.S. Bureau of Labor Statistics
- Smith Travel Research




Urban to Rural Evacuation Tool
Expected target counties for evacuees from Detroit, MI
MI
Grand Rapids
Milwaukee
Detroit
Buffalo
NY
Cleveland
Chicago
Akron
PA
IL
Fort Wayne
Pittsburgh
OH
Columbus
WV
MD
100 miles
160 km
Select map view
Explore Resources
Select data field
none
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A Regional Partnership for Public Health
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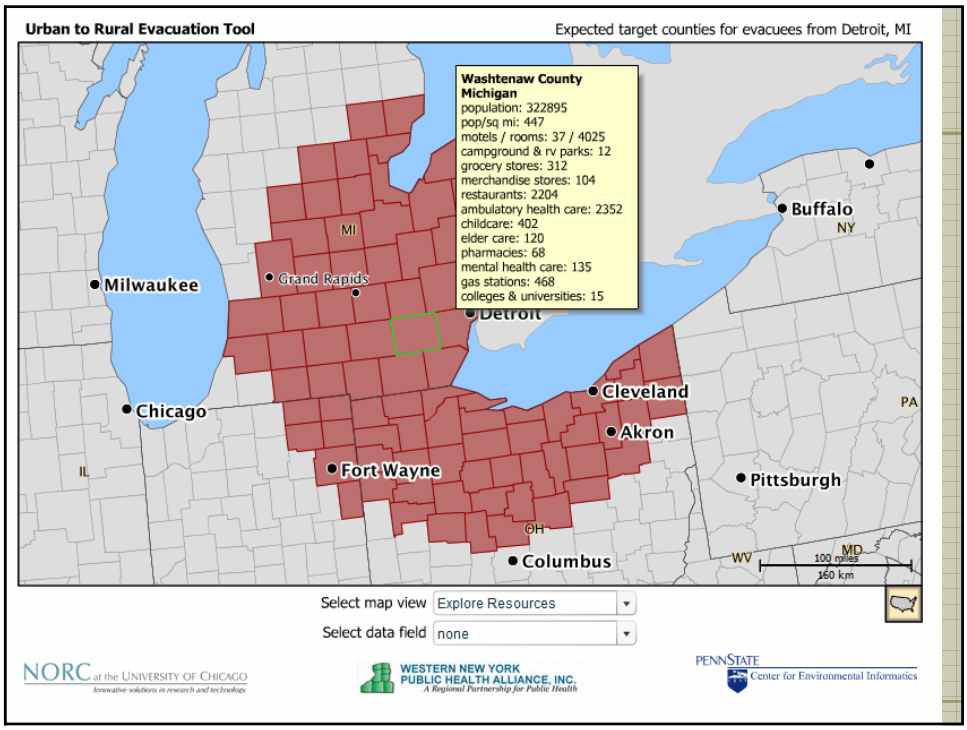
Urban to Rural Evacuation Tool
Expected target counties for evacuees from Detroit, MI
Washtenaw County
Michigan
population: 322895
pop/sq mi: 447
motels / rooms: 37 / 4025
campground & rv parks: 12
grocery stores: 312
merchandise stores: 104
restaurants: 2204
ambulatory health care: 2352
childcare: 402
elder care: 120
pharmacies: 68
mental health care: 135
gas stations: 468
colleges & universities: 15
MI
Grand Rapids
Milwaukee
Detroit
Buffalo
NY
Cleveland
Chicago
Akron
PA
IL
Fort Wayne
Pittsburgh
OH
Columbus
WV
MD
100 miles
160 km
Select map view
Explore Resources
Select data field
none
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A Regional Partnership for Public Health
PENNSTATE
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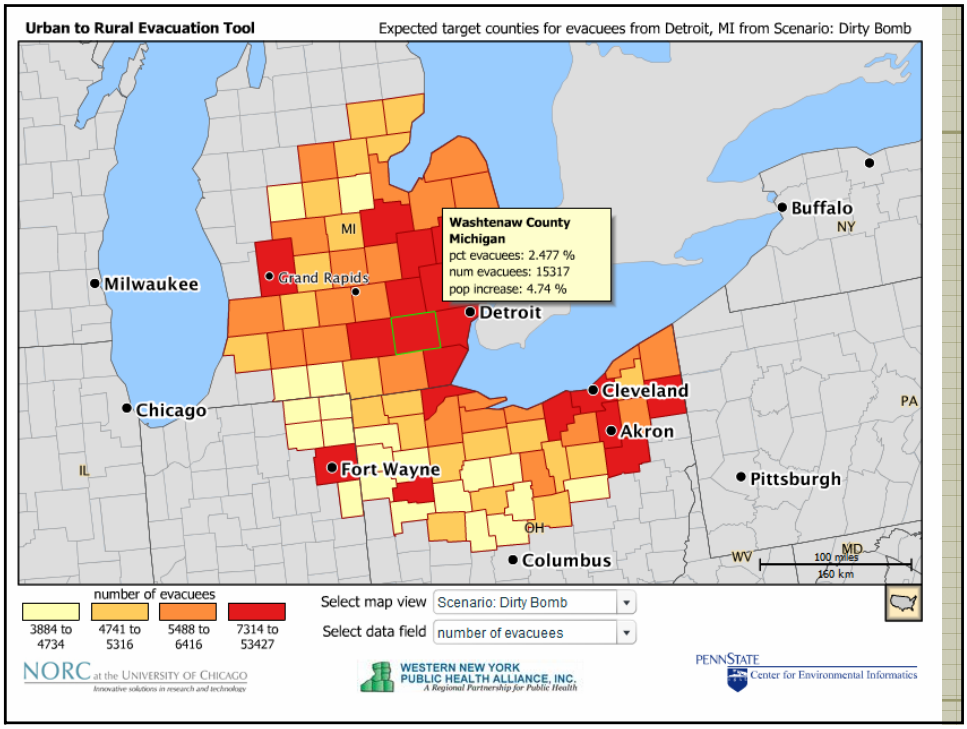
Urban to Rural Evacuation Tool
Expected target counties for evacuees from Detroit, MI from Scenario: Dirty Bomb
Washtenaw County
Michigan
pct evacuees: 2.477 %
num evacuees: 15317
pop increase: 4.74 %
MI
Grand Rapids
Milwaukee
Detroit
Buffalo
NY
Cleveland
Chicago
Akron
PA
IL
Fort Wayne
Pittsburgh
OH
Columbus
WV
MD
100 miles
160 km
number of evacuees
3884 to 4734
4741 to 5316
5488 to 6416
7314 to 53427
Select map view
Scenario: Dirty Bomb
Select data field
number of evacuees
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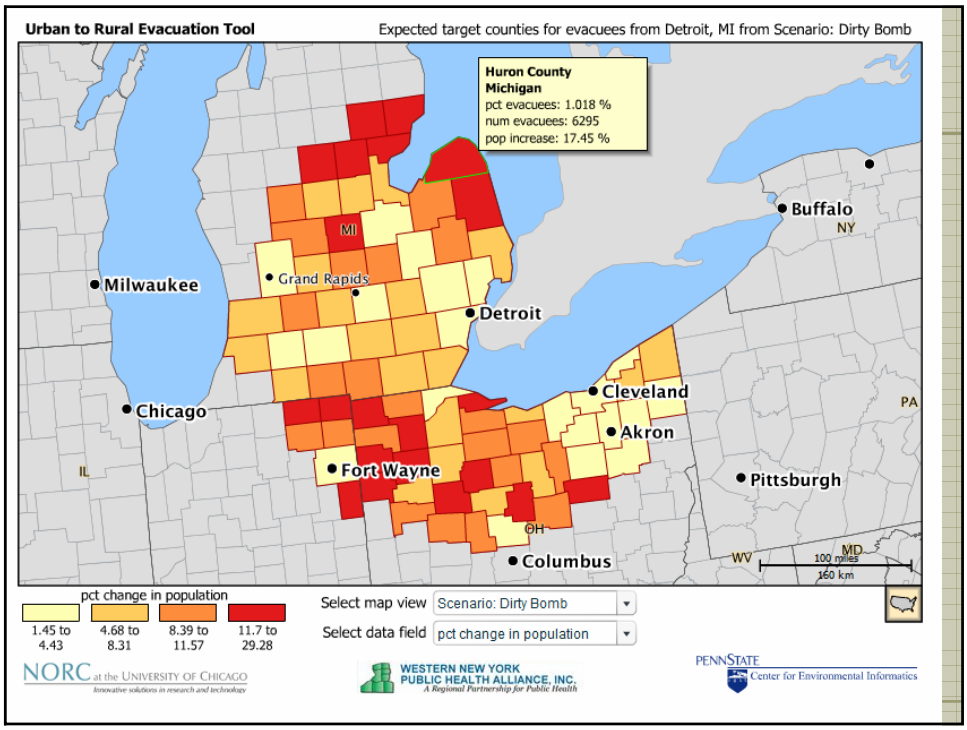
Urban to Rural Evacuation Tool
Expected target counties for evacuees from Detroit, MI from Scenario: Dirty Bomb
Huron County
Michigan
pct evacuees: 1.018 %
num evacuees: 6295
pop increase: 17.45 %
MI
Grand Rapids
Milwaukee
Detroit
Buffalo
NY
Cleveland
Chicago
Akron
PA
IL
Fort Wayne
Pittsburgh
OH
Columbus
WV
MD
100 miles
160 km
pct change in population
1.45 to 4.43
4.68 to 8.31
8.39 to 11.57
11.7 to 29.28
Select map view
Scenario: Dirty Bomb
Select data field
pct change in population
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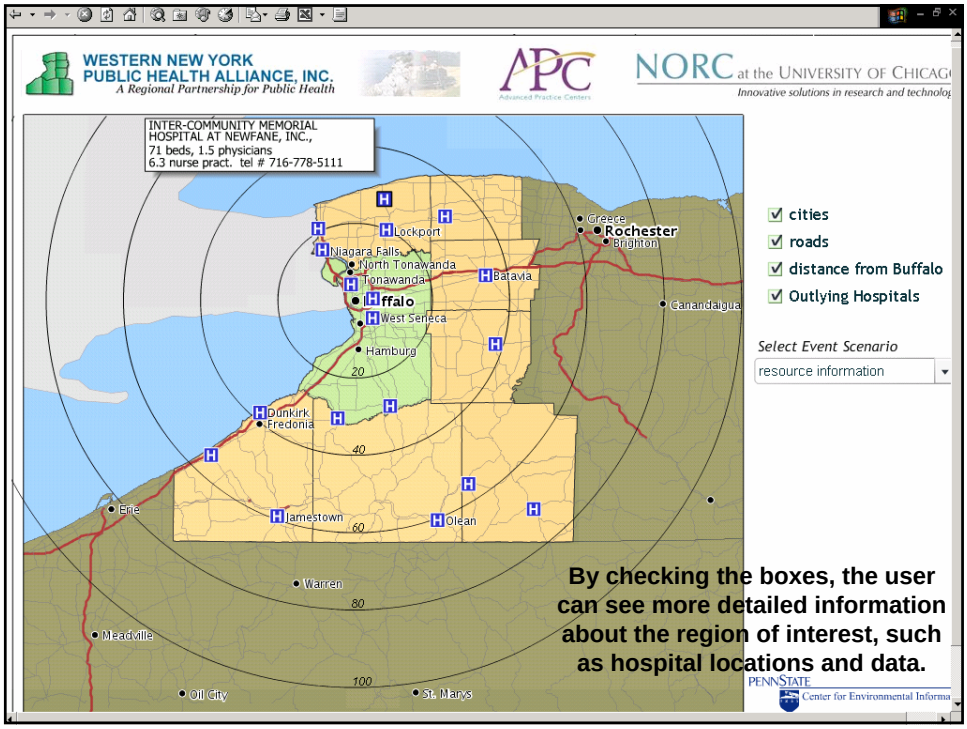
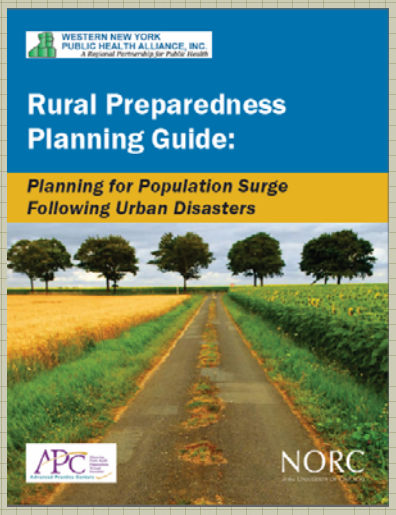


Implications for Rural Preparedness Planning

- Convened expert panel of rural/ suburban first responders and emergency planners on February 4th to identify key planning considerations for rural communities.
- Representation from CA, TX, PA, MS, NY and KS
- Included: emergency coordinator, fire/safety responder, county health commissioner, and heads of local or regional health departments

Implications for Rural Preparedness Planning

- *Rural Preparedness Planning Guide*
- Panel findings synthesized into set of guidelines
- Intended audience: rural preparedness planners (local health depts., emergency managers, etc.)



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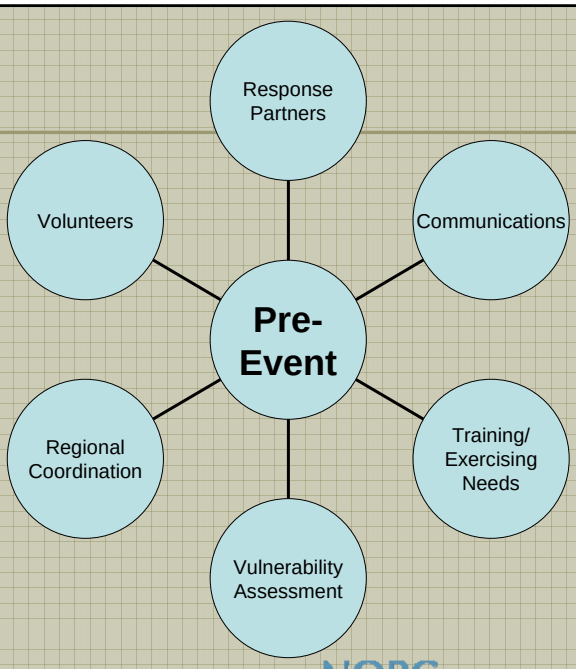

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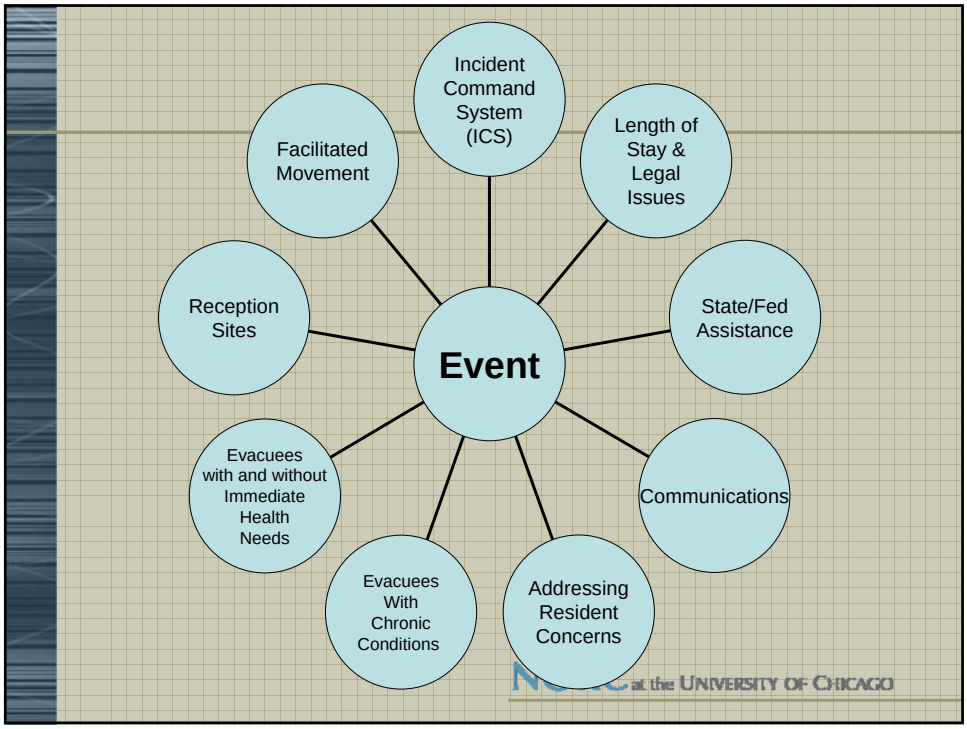
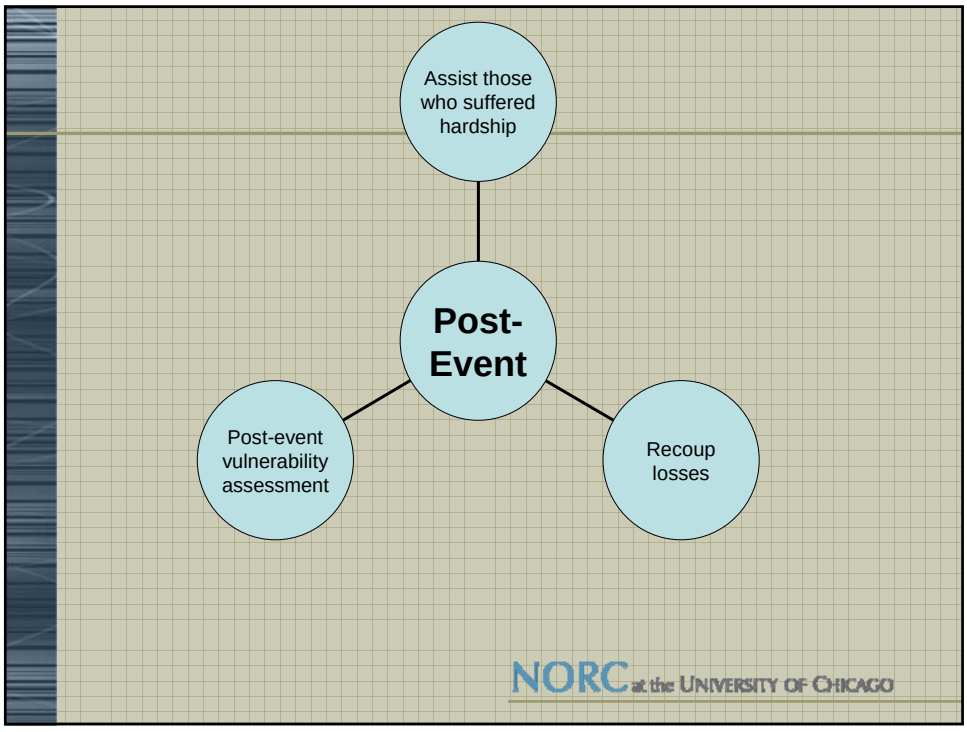

Incident Command System (ICS)
Facilitated Movement
Length of Stay & Legal Issues
Reception Sites
Event
State/Fed Assistance
Evacuees with and without Immediate Health Needs
Communications
Evacuees With Chronic Conditions
Addressing Resident Concerns
at the UNIVERSITY OF CHICAGO


Assist those who suffered hardship
Post-Event
Post-event vulnerability assessment
Recoup losses
NORC at the UNIVERSITY OF CHICAGO

Appendices

- Are documents/templates the panelists felt rural planners would find helpful
- Appendices include:
  - Sample mutual aid agreements
  - Sample portable trailer supply list
  - Sample emergency supply check-list to distribute to residents
  - Sample triage plan

NORC at the University of Chicago

PRE-EVENT PLANNING

Response Partners	Responsible Entity/Person	Date Assigned	Date Completed
Identify response partners, keeping in mind that partners may vary depending on type of scenario. Form population surge response team. ▶ Consider including members of the following sectors: environmental health, mental health, faith community, local media, local pharmacies, and transportation, in addition to traditional response partners such as law enforcement, EMS, American Red Cross, etc. ▶ Consider professionals outside of traditional medical partners (i.e. dentists, veterinarians).			
Identify and establish an agreement with a local facility to serve as a quarantine site or alternate care facility in the event of an infectious disease outbreak. ▶ Ensure that the facility has laundry facilities, a kitchen, and space to establish a medical clinic.			
Establish agreements for evacuee sheltering—determine locations and necessary capacities to address population surge. ▶ Consider number of likely evacuees that may settle in your community without existing shelter arrangements (plan for at least 20% of evacuees needing shelter). ▶ Identify and engage partners in planning for necessary food, medicine, medical care, security, transportation, etc.			

General recommendations

- General issues planners must keep in mind when formulating response plans

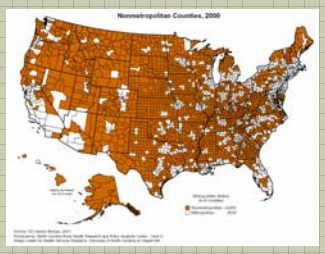
General recommendations for pre-event recruitment of volunteers:

- Assure volunteers in advance that they will receive protection and will be the community's top priority (e.g., they will receive immunizations first in the event of infectious disease).
- Be sure volunteers are who they say they are. Unqualified volunteers can be a hindrance to disaster relief. The Emergency Management Assistance Compact (EMAC) has been ratified by all states and can assist in ensuring that credentials are standard across state boundaries.
- Volunteer liability varies by state. Know your state's rules—potential volunteers will ask.
- Pay particular attention to recruiting volunteers with multi-lingual capabilities if possible, and maintain a database of those capabilities (including American Sign Language).

Next steps

Added Functionalities

- Evacuee demographic information; ability to "turn off counties"; cumulative "through" totals; ability for users to manipulate push variable; etc.



User Testing

- We will conduct web-based user testing to refine the user interface and produce optimal outputs to stimulate preparedness planning.

Incorporation of Scenarios

- Scenario descriptions will be incorporated to operationally define scenario leading to modeled evacuation.

Future Directions

Training

- A training component would be built around the tool, targeting emergency preparedness officials across disciplines, as well as policymakers.
- Trainees would receive information on the topic of population surge resulting from urban evacuation, learn to use the tool, obtain information specific to their own communities, and learn planning tools and strategies for community response.
- Would stimulate cross-border/cross-agency collaboration.

Future Directions

Urban Non-Evacuee Modeling

- To address the issue of non-evacuees who may require emergency response assistance, the urban component of the tool would be augmented with zoom features to the block group or census tract level highlighting potential pockets of non-evacuees – essentially the reverse of the current modeling.
- Goal is to increase efficiency of assisted evacuation (e.g., by National Guard) by providing likely locations of and descriptive information about non-evacuating individuals and households.

Future Directions

State-Specific Versions

- To refine modeling by including state-level data sets
- To model at the sub-county level
- To model beyond 100 urban area threshold
- To model beyond 150 mile radius
- To include additional functionalities (e.g., determination of pre-deployment sites)

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